NOTE. Throughout the foregoing investigation it has been assumed that the signs of b_2, b_4, and b_6 in formulas (6), (7) and (8) will be $+$, $-$ and $+$ respectively, so that the signs of the constant a will be $-$, $+$ and $-$ respectively. This is true for any anjustment formula likely to be used in practice, but others can be constructed so that b_2, b_4 and b_6 will have signs contrary to the above. In such cases, the successive coefficients of the resultant formula tend to diverge from eachother as k increases, and in passing to the limit from (5) we cannot neglect differences of a higher order in comparison with those of a lower one. Take for example

$$u'_0 = \tfrac{1}{3}[3u_0+(u_1+u_{-1})+(u_2+u_{-2})],$$

for which $b_2 = -1$. The following table shows a few of the coefficients of the resultant formulas for 2, 4, 8 and 16 applications, as found by formula (7). (ANALYST, p. 67.) It is evident that, at the limit, some of the coefficients will become infinite and positive, others infinite and negative, and the excess of the sum of the positve over the sum of the negative ones will be unity. The series will be discontinuous, and there can be no limiting curve. Thus in (10), when b_2 is negative, h becomes imaginary; and in (13) and (19), if b_4 is $+$, then a becomes $-$, and A and B are imaginary.

	1	2	4	8	16
l_0	1.00	1.44	3.22	21.1	1297
l_1	.33	.44	.99	5.9	341
l_2	$-$.33	$-$.55	$-$1.73	$-$14.5	$-$1014
l_3		$-$.22	$-$1.04	$-$10.3	$-$ 765
l_4		.11	.43	4.8	433
l_5			.35	6.7	717
l_6			$-$ .07	$-$ .4	$-$ 4
&c.			&c.	&c.	&c.

NOTE ON THE CORRESPONDENCE OF MATERIAL FORMS WITH MATHEMATICAL RELATIONS.

BY THE EDITOR.

LIFE, sensation and consciousness are conditions found only in connection with definite material forms which constitute a part of the universe of matter; and the names used to denote the sensations experienced by the conscious individual are a representation of the external world. All knowledge is, therefore, but experience of impressions made by the world

of matter; and, therefore, all mathematical relations should have their analogue in the external world.

We have heretofore (see *Popular Science Monthly* for February 1874, p. 494) attempted to represent, by mathematical forms, the actual condition of the universe of matter, as here quoted: "There is, therefore, as I conceive, absolutely no limit to the division of matter, physically as well as mathematically; but our organization is such that, of the infinite series of terms in which it manifests itself, we can know, experimentally, only two; viz., the stellar universe, constituting the first *order*, of which the stars and the planets are the units; and, secondly, the chemical molecules, which constitute the second *order*.

"According to this view, the material universe might be represented in *orders* by the following series:

$$d^{-m}x, \ldots\ d^{-3}x,\ d^{-2}x,\ d^{-1}x,\ d^{0}x,\ dx,\ d^{2}x,\ d^{3}x, \ldots\ d^{n-1}x,\ d^{n}x,$$

in which x is the unknown quantity, called matter, and m and n are both infinitely great. In this series, d^0x, or simply x, would represent all tangible matter; and dx, which is the next term, *descending*, would represent the chemical molecule."

Whether the mathematical forms here presented are correct representations of the natural divisions of unorganized matter, or not, each individual will decide for himself, as no demonstration is, perhaps, possible; but that chemical combinations, and vegitable, and probably animal, organizations are represented in thought by algebraical forms, is, not only probable, but, a demonstrated fact; so that, in the language of Professor Sylvester, "Chemistry is the counterpart of a province of algebra, as probably the whole universe of fact is, or must be, of the universe of thought." (See *American Journal of Mathematics*, Vol. I, p. 83.)

TO FIND THE EARTH'S DISTANCE FROM THE SUN AT ANY GIVEN TIME.

BY ARTEMAS MARTIN, M. A., ERIE, PA.

LET AEP represent the orbit of the Earth, and let S represent the Sun in one of the foci.

Let a and b be the semi axes of the orbit, E the position of the Earth n days from the perihelion, $r =$ the radius vector SE, $\varphi = PSE$, the angular distance of the Earth from the perihelion, and $c =$ the area daily passed over by the radius vector.